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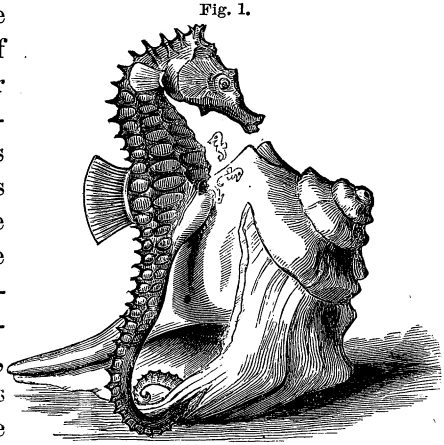
THE SEA-HORSE AND ITS YOUNG.

BY REV. SAMUEL LOCKWOOD.

"SIR," said an aged fisherman, "there is nothing on the Land that is not in the Sea!" The old waterman's terseness forestalled the philosophic dictum of the poet,—"Whether we live by the sea-side, or by the lakes and rivers, it concerns us to attend to the nature of fishes, since they are not phenomena confined to certain localities only, but forms and phases of the life in nature universally dispersed." Among these forms is a remarkable Order, called by systematists the Lophobranchs, which stand apart from the others by two well-defined, and very curious distinctions. They differ from other fishes in the peculiar structure of the gill arches, by

Fig. 1.



which the gills are arranged in little tufts on each side of the head under the "cheek" bones or gill covers. Hence the name Lophobranch, which is derived from the Greek, signifying tuft-gilled. But, perhaps, more curious is that distinction drawn from their mode of reproduction; a trait so strange, as to suggest the seemingly abnormal habits of the Marsupials,—the Opossum and the Kangaroo,—although the eccentricity of the fish is far greater than that of the land marsupial; for, in the latter, it is the female whose pouch receives the immature young, and which are therein nourished to complete their development. The parental relation of the female Lophobranch, however, is restricted to the simple emission of the unimpregnated eggs. Beyond this, maternity she has none. The male is really, and literally, father and mother to the progeny; and so far as the reproductive instincts are concerned, it would seem that the female manifestation is summed up and exhausted in the one solitary and singular act of a formal consignment of the ova to the embryonal sack of the male.

Though the species of the Lophobranchs are quite numerous, they are all referable to three principal groups or families, of which the Flying Dragon (*Pegasus*), the Sea-horse (*Hippocampus*), and the Pipe-fish (*Syngnathus*) are types. The following observations were made upon the *Hippocampus hudsonius* De Kay, or the common Sea-horse of the Atlantic coast of the United States.

A sea-side residence favoring the design for the past ten years, I have let no opportunity slip of studying the habits of the Sea-horse, hoping to get at some of the necessarily interesting facts which must stand connected with its peculiar mode of reproduction. Owing to difficulties too tedious for detail, nothing like gratifying suc-

cess was attained until the autumn of 1866. Nearly a year had passed without obtaining a single living specimen, when a waterman brought me two full-grown ones, and to my great joy they proved to be "gravid" males. Alas! my oft-repeated experience returned; for, owing to the shock produced by the ordeal of acclimation, they began to involuntarily emit their young. None but a working naturalist can appreciate the anxiety I then suffered. The next day one of my Hippos died, having from debility first set free all its immature young, which were sufficiently developed to indicate plainly their family relation. My estimate was that they were twelve-day embryos. I now redoubled my efforts to invigorate and save the remaining adult, by solicitously watching every circumstance of temperature, æration, and light. In spite of all, the emission of the young went on, until instinct, prompted by increasing debility, led the parent to expel the rest by voluntary effort. *How* this was done was a great point gained. Except a few floating fronds of Ulva, other than the fish, there was no object in the water. And here the structure of the Sea-horse's tail should be borne in mind, so unlike that of any other fish, covered with an envelope, consisting of bony scales; four-sided, and suggesting a small square file; in faculty, prehensile, like that of some monkeys; and of considerable length. Bending this appendage upwards like an inverted crook, thus imparting to it muscular rigidity, the animal pressed it against the bottom of the embryonal pouch, which occupied the lower part of the abdomen, thus pushing its contents upward, and forcing them out of the opening on the top of the sack; the creature all this time sustaining its normal, erect position in the water. The extruded young immediately perished. Relieved of his charge,

my Hippo soon recovered strength, and became for several months a very interesting pet.

September 7. To-day fortune smiled and brought me another "gravid" male Hippocampus. This also, under the weakening effects of acclimation, began excluding the young, having emitted a full dozen. Circumstances favoring, and profiting by a varied experience, I was enabled to carry my new Hippo safely through the dreaded ordeal. Most anxiously was he watched day by day. To my astonishment no enlargement of the embryonal sack could be detected. I supposed that as the young increased in size, the distension of the pouch would go on equally. Again my apprehensions were aroused,—now I feared that the fœtuses were dead!

September 21. A red-letter day! To-day near noon I observed three young Sea-horses swimming about. They had just made their *debut*. Very minute creatures they were; but, to my great joy, nearly perfect. From that hour the *Pater-mater* kept busy setting his progeny adrift. At the bottom of the vessel was a broken Winkle-shell, put there for the attachment of the animal's tail, when fatigued by swimming, as the Sea-horse is very easily tired, and this, monkey-like, is its favorite mode of taking rest. The Winkle afforded real help in the labor of extruding the young, which is in no sense a parturient process, but on the contrary is entirely mechanical, and in the present case was effected in the following manner. With its abdomen turned towards the shell, its tail attached to the under part of it, the body erected to its full height, the animal, by a contractile exertion of the proper muscles, would draw itself downwards, and against the shell, thus rubbing the pouch upward, and in this simple, yet effective way, expelled

the fry at the opening on top of the sack (See Fig. 1). It was said above that the Sea-horse is soon wearied, with even moderate exertion; hence, probably, it was, that these repeated acts were each followed by a few minutes of rest. Indeed, the extrusion of its young lasted for nearly six hours, from three to six individuals being set free at a time.

The scene that followed was one of singular and lively interest. I was nervous with delight, and wished that every Naturalist could see it for himself. I am sure there is no student of nature but will excuse the enthusiasm which prompted me to write at once to a friend, that "he must not set the minister down as a horse-jockey, on being informed that he was now the proud possessor of the most numerous drove of colts ever owned by one man the whole wide world over." Using my best judgment,—for, owing to the mazy motion of this tiny throng, counting was out of the question,—I set the number down as not far from a thousand. Each measured from five to six lines in length. Very minute creatures, truly, when one considers how large a portion is taken up by the tail, which organ was of but little more than thread-like dimensions. We might suppose it would require a few days for the young Hippo to find out the remarkable monkey-like endowment of its tail. Not so. Only look at what my own eyes beheld many a time, when a "stampede" of these little colts was going on, although they were but one day old. There come two little Hippos, each swimming in a direction at right angles to that of the other. Just at the point of passing, one, lasso-like, whips his caudal extremity round that of his fellow, who, of course, in like manner, returns the caudal compliment, which, to speak technically, acts as a "double lock." Of

course both pull, and, by a natural law, the force is exerted in exactly opposite directions, and the right angle is resolved into a straight line. It is but poor head-way they make, nor does it mend the matter much, that a third little fellow comes giddily on, and, switching his tail, takes a hitch at that precise point in space where the other two met. Now a triple force is exerted, and the effect is, with two straight lines to project three obtuse angles. And so the three toil on, obtusely laboring *in statu quo*. But a droller sight is that of yonder juvenile Lophobranch, who seems to be of somewhat belligerent proclivities, as he is leading by the nose a weaker member of his own species, having with his caudal extremity noosed him on the snout. These funny antics, though oft repeated, are of short duration, as the parties soon have to rest, from sheer fatigue.

On the fifth of October the last of my little Hippos died.

In the matter of fœtal sustenance, I find a remarkable marsupial analogy in the Hippocampus. The pouch of the Kangaroo and the Opossum contains teats, with which, by true lactation, the young are nourished until fully formed. Nor is the embryonal sack of the Sea-horse a mere receptacle, or nest, for the hatching of the eggs,—the fish does, in and by the pouch, supply nourishment to the growing young. The mass of fry on the day of its extrusion is certainly in bulk several times greater than that of the original egg-mass. We know that the bear during hibernation lives upon the fat acquired the previous season. During a journey that requires abstinence from food, the well-conditioned camel will subsist on the absorption of its fattened hump. The tail of the frog, which has just completed its last metamorphosis, does not

pass off by atrophy, but is really a wise provision for the creature's support by absorption, during the few days which constitute the most critical period of its life.

This fact I have demonstrated elsewhere by observations from the spawn to maturity. But in these and similar cases, the animal is simply nourished by some superabundance in itself. Ruling out lactation, and the placental phenomena of gestation, is there any instance in which, as a normal fact, the young feeds upon the parent? This fact, seemingly so anomalous, I assert for the Hippocampus, although its physiology I may not be able to explain. The male Sea-horse not only hatches the eggs in the embryonal pouch, but also feeds the young by allowing them to absorb a portion of himself. This is done during the embryo's consumption of the placental yolk, and also, especially and more rapidly, after that source of food is all exhausted. Of course, upon receiving the ova the pouch might be supposed to be considerably distended. This distension is really very trifling. And during development the enlarging of the sack might be expected; but it is inappreciable. At the time of receiving the spawn, the wall of the pouch is not less than three lines thick, and well stored internally with fat. At the time of expulsion of the developed fry, the same sack is not half a line thick, and hangs flaccid on the animal, a mere thin membrane. In due time it becomes again thick, firm, and fat as before, and in such state has been mistaken by me for a gravid condition. This interesting fact of a true marsupial nourishment, and of so unique a character, although suspected, was not accepted, until established by dissection, and observation of a male that had gone through the course described. Moreover, I believe in part may be thus explained the impulse to that forcible

eviction of the immature young, which has been already described. The debility caused by the consumption of the parent, together with the weakening of acclimation, seems to have impelled to the act.

But with the exclusion of the young, the marsupial likeness stops in the Sea-horse, though the young Pipe-fishes are said to reënter the pouch on finding themselves in danger. It is my belief that with the Sea-horse the termination of development is the end of their solicitude for the young.

As to the moral relation of the sexes in this apparently abnormal creature, I must regard it, on the instinctive side, as but little superior to the relation of a pistillate to a staminate plant. The emission of the ova by the one is a simpler matter, all the facts considered, than the seeding of the other. Certainly the love emotion, if any, must be very simple, scarcely more than the poetic figment of the loves of the flowers. Is not the fertilization of the spawn performed by the male after its reception into the embryonal pouch? Besides, that which is usually normal in the female, is in this instance wholly wanting, namely, affection for, and even the knowledge of the young; for she never sees them. Whereas the male, even though pressed by hunger, will not molest his offspring,—a remarkable fact, when we reflect that generally fishes have no scruples against devouring any fry, even their own. This trait of the male Sea-horse is found in the male Stickleback. The former is not very demonstrative, nor can he be, owing to his organization; but the latter is highly so, even to vindictiveness, as I have seen him severely punish the female in his anxiety for the safety of the spawn. There are other undetermined, although interesting facts, connected with this question of sexual relation. What is

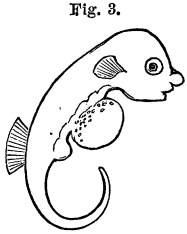
the numerical proportion of the sexes? Does the male incubate the ova of more than one female at a time?

Allusion has been made to the Stickleback. It was to the two-spined species (*Gasterosteus biaculeatus*). This species breeds in the months of March, April, and May. Much depends upon the season. Generally the whole matter is over by the last week in April. My experience, from the examination of many gravid specimens, indicates that the Sea-horse breeds in August and September.

Fig. 2, though drawn without the proper aid from the microscope, is intended to exhibit some of the fœtal phenomena, and represents the premature young, which I have supposed to be twelve days old from the commencement of incubation. Fig. 3 is one of the same magnified, and presents the following particulars worthy of note. First, the tail is round, instead of quadrangular; second, the dorsal fin is set farther back than in the adult; third, the pectoral fins are also farther back on the nape than in the adult (though not to the same extent, yet facts two and three I have seen in fœtuses much older); fourth, the extreme shortness and great width of the muzzle.

Fig. 2.

Fig. 3.



The Sea-horse, when taken fresh from his native home, though almost laughably grotesque, is a very pretty creature. Its general color is ashen gray; at first glance, an exceedingly sober suit. But if examined more closely, it will be found thickly studded with tiny spangles of metallic silver. Add to this its rich armature of daintily carved plates, like a coat of mail, its body always pertly erect, and, bent forward, it looks like the steed of a knight-errant in quest of adventure; and those pretty,

golden, yet queer little eyes, chameleon-like, independent of each other, intently gaze two ways at once. Then as to that dorsal fin, in oddity and beauty it has no compeer among its ichthyic rivals, so tastily fringed with a neat border of delicate yellow, precisely like the yellow tipping of the tail of the Cedar-bird (*Ampelis cedrorum*). In truth, this dorsal fin is cruelly libelled in every engraving we have ever seen. In nature it is an exquisite fan, in form, size, and ornament, worthy the hand of Queen Mab. Thus our Sea-horse, though anomalous in form and habit, has beauty united with its strange features, and grace with its eccentricity. In fine, as we look at his equine appearance, and think of his monkey faculty, and his opossum traits, and that queer blending of innocent oddity with patriarchal dignity, we have to accept the old fisherman's proverb,—"There is nothing on the Land that is not in the Sea."

THE RECENT BIRD TRACKS OF THE BASIN OF MINAS.

BY C. FRED. HARTT, A. M.

(Concluded from p. 176.)

Sir Charles Lyell, who visited Nova Scotia in 1842, first called attention to the recent bird tracks of the Basin of Minas, and Dr. J. W. Dawson, the distinguished Nova Scotian geologist has treated of them in his interesting little volume, "Acadian Geology."

The mud flats of the Minas Basin are made up to a very large extent, some entirely, of these thin layers of mud, deposited by the successive tides. The deposition of the layers does not of course go on equally everywhere, but